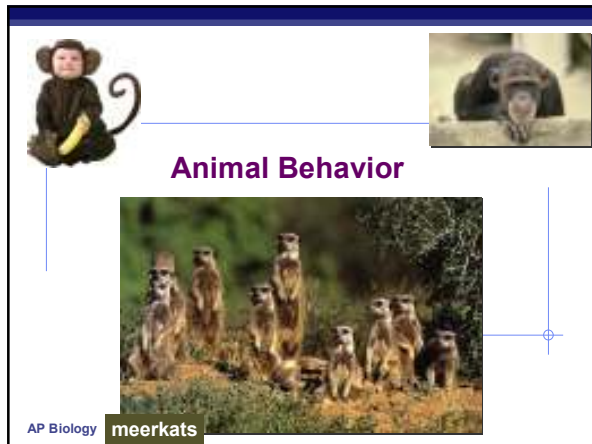


AP Biology



Animal Behavior

meerkats

AP Biology

What is behavior?

- Behavior
 - everything an animal does & how it does it
 - response to stimuli in its environment
 - innate**
 - inherited, "instinctive"
 - automatic & consistent
 - learned**
 - ability to learn is inherited, but the behavior develops during animal's lifetime
 - variable & flexible
 - change with experience & environment



AP Biology

Why study behavior?

- Evolutionary perspective...
 - part of phenotype
 - acted upon by natural selection
 - lead to greater fitness?
 - lead to greater survival?
 - lead to greater reproductive success?



AP Biology

AP Biology

What questions can we ask?

- **Proximate causes**
 - ◆ immediate stimulus & mechanism
 - ◆ “how” & “what” questions
- **Ultimate causes**
 - ◆ **evolutionary significance**
 - ◆ how does behavior contribute to survival & reproduction
 - adaptive value
 - ◆ “why” questions

male songbird
→ what triggers singing?
→ how does he sing?
→ why does he sing?

Courtship behavior in cranes
→ what...how... & why questions
→ how does daylength influence breeding?
→ why do cranes breed in spring?



Evolutionary perspective

- **Adaptive advantage?**
 - ◆ **innate behaviors**
 - automatic, fixed, “built-in”, no “learning curve”
 - despite different environments, all individuals exhibit the behavior
 - ex. early survival, reproduction, kinesis, taxis
 - ◆ **learned behaviors**
 - modified by experience
 - variable, changeable
 - flexible with a complex & changing environment

AP Biology

Ethology

1941 | 1973

pioneers in the study of animal behavior

Karl von Frisch Niko Tinbergen Konrad Lorenz




AP Biology

AP Biology

Innate behaviors

- Fixed action patterns (FAP)**
 - sequence of behaviors essentially unchangeable & usually conducted to completion once started
 - sign stimulus**
 - the releaser that triggers a FAP

male sticklebacks exhibit aggressive territoriality



Actual colour & shape: Male stickleback: red belly, bluish-white back; Female stickleback: greyish-green body, swollen silvery belly.


Model characteristics: Red belly; Swollen belly.

Reaction of males to model: Attack; Court.


attack on red belly stimulus
court on swollen belly stimulus

Fixed Action Patterns (FAP)


Digger wasp



egg rolling in geese



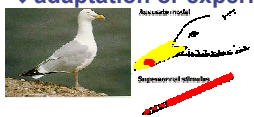
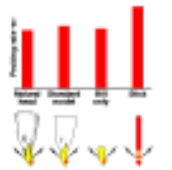
Do humans exhibit Fixed Action Patterns? The "eyebrow-flash"




AP

Supernormal Stimulus

- Responding more to a larger sign stimulus
 - adaptation or experimental artifact?

does lipstick create a supernormal stimulus in humans





AP Biology

AP Biology

Innate: Directed movements

- Taxis**
 - change in direction
 - automatic movement toward (positive taxis) or away from (negative taxis) a stimulus
 - phototaxis
 - chemotaxis
- Kinesis**
 - change in rate of movement in response to a stimulus

AP Biology

Complex Innate behaviors

- Migration**
 - “migratory restlessness” seen in birds bred & raised in captivity
 - navigate by sun, stars, Earth magnetic fields



Monarch migration

Sandpiper

Bobolink

ancient fly-ways

Golden plover

Innate & Learning: Imprinting

- Learning to form social attachments at a specific critical period**
 - both learning & innate components




AP Biology

Konrad Lorenz

IMPRINTING (LERNEN) During an early, critical developmental period, the young geese learn that Lorenz is their mother and follow him.

DEEPER LEARNING In another group, the goslings were exposed to their mother, Lorenz, and a female mallard duck, and that had a greater chance of following the female that did not follow Lorenz.

AP Biology

Conservation

Conservation biologists have taken advantage of imprinting by young whooping cranes as a means to teach the birds a migration route. A pilot wearing a crane suit in an Ultralight plane acts as a surrogate parent.



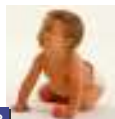
AP Biology

Critical period

- Sensitive phase for optimal imprinting
 - ♦ some behavior must be learned during a receptive time period



As a brood parasite, the Cuckoo never learn the song of their species as a nestling. Song development is totally innate.



Learned behavior

- **Associative learning**
 - ♦ learning to associate a stimulus with a consequence
 - **operant conditioning**
 - ♦ trial & error learning
 - ♦ associate behavior with reward or punishment
 - ♦ ex: learning what to eat
 - **classical conditioning**
 - ♦ Pavlovian conditioning
 - ♦ associate a "neutral stimulus" with a "significant stimulus"



Copyright 2011 by Pearson Education, Inc. All rights reserved.

AP Biology

Operant conditioning

- Skinner box



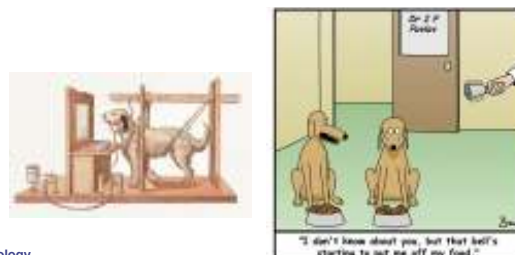
B. F. Skinner

mouse learns to associate behavior (pressing lever) with reward (food pellet)

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Classical conditioning

- Ivan Pavlov's dogs
 - connect reflex behavior (salivating at sight of food) to associated stimulus (ringing bell)

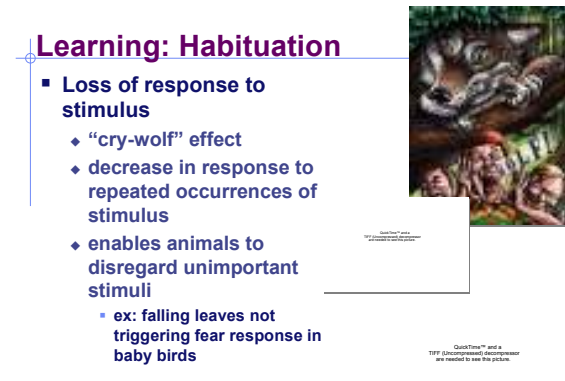


AP Biology

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Learning: Habituation

- Loss of response to stimulus
 - “cry-wolf” effect
 - decrease in response to repeated occurrences of stimulus
 - enables animals to disregard unimportant stimuli
 - ex: falling leaves not triggering fear response in baby birds



AP Biology

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

AP Biology

Learning: Problem-solving

- Do other animals reason?

chimpanzee

problem-solving

crow

tool use

sea otter

Social behaviors

- Interactions between individuals
 - develop as evolutionary adaptations
 - communication / language
 - agonistic behaviors
 - dominance hierarchy
 - cooperation
 - altruistic behavior

AP Biology

Language

- Honey bee communication
 - dance to communicate location of food source
 - waggle dance

Let's go to the videotape!

(A) Bees clustering around a recently returned worker

(B) Round dance


(C) Waggle dance

AP Biology

Communication by song

- **Bird song**
 - ◆ species identification & mating ritual
 - ◆ mixed learned & innate
 - ◆ critical learning period
- **Insect song**
 - ◆ mating ritual & song
 - ◆ innate, genetically controlled

Red-winged blackbird



AP Biology

Social behaviors

- **Agonistic behaviors**
 - ◆ threatening & submissive rituals
 - symbolic, usually no harm done
 - ◆ ex: territoriality, competitor aggression



AP Biology

Social behaviors

- **Dominance hierarchy**
 - ◆ social ranking within a group
 - pecking order



AP Biology

AP Biology

Social behaviors

- **Cooperation**
 - ◆ working together in coordination

Pack of African dogs hunting wildebeest cooperatively



White pelicans "herding" school of fish



AP Biology

Social behaviors

- **Altruistic behavior**
 - ◆ reduces individual fitness but increases fitness of recipient
 - ◆ **kin selection**
 - increasing survival of close relatives passes these genes on to the next generation




I would lay down my life for 2 brothers or 8 cousins!

How can this be of adaptive value?



Beelding ground squirrel

Social interaction requires communication

- **Pheromones**
 - ◆ chemical signal that stimulates a response from other individuals
 - alarm pheromones
 - sex pheromones



When a conspecific is injured or in distress, alarm pheromones are released and stimulate a response in other conspecifics.




Sex pheromones are released by the sex of the same species and stimulate a response in other conspecifics of the opposite sex.

AP Biology

human sex pheromone?

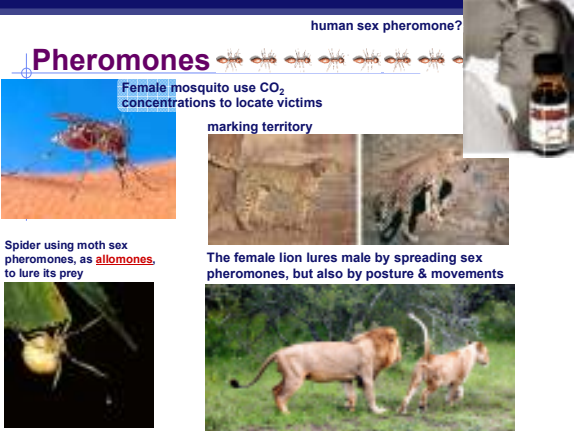
Pheromones

Female mosquito use CO₂ concentrations to locate victims

marking territory

Spider using moth sex pheromones, as **allomones**, to lure its prey

The female lion lures male by spreading sex pheromones, but also by posture & movements



Colonial mammals

convergent evolution:
bees, ants, termites...
mole rats

▪ **Naked mole rats**

- ◆ underground colony, tunnels
- ◆ queen, breeding males, non-breeding workers
- ◆ hairless, blind

"Picture a hot dog that's been left in a microwave a little too long...add some buck teeth at one end, and you've got a fairly good idea of what a Naked Mole Rat looks like."



Any Questions??



AP Biology


AP Biology

EXTRA SLIDES

AP Biology

Mating & parental behavior



- **Genetic influences**
 - ◆ changes in behavior at different stages of mating
 - pair bonding
 - competitor aggression
- **Environmental influences**
 - ◆ modifies behavior
 - quality of diet
 - social interactions
 - learning opportunities



AP Biology

Pheromones

Human pheromones?



AP Biology

"Hold it right there, young lady! Before you go out, you take off some of that makeup and wash off that gallon of perfume!"
